Distributed Energy Resources Chicago Industrial Energy Plan

GAS TECHNOLOGY INSTITUTE (GTI) - DES PLAINES, IL

Project Team

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Project Partners
City of Chicago Department of Environment
University of Illinois at Chicago - ERC

Project Mission

- **Demonstrate Distributed Energy's contribution to a Sustainable Urban Environment**
  - Lower Energy Costs and Improve Grid Utilization
  - Improve Overall Air Quality
  - Increase Energy Efficiency
- **Contribute to DOE' s Goal to deploy 50GW DER**
  - Identify and develop small scale industrial market
- **Address Barriers**
  - Identify incentives
  - Reduce DER costs via standard designs
  - Improve industrial processes

Approach

- Develop standard program to maximize industrial DER in an urban setting
  - Can be repeated in other cities
  - Relieve constrained grid areas
  - Reduce emissions from existing sources
- Develop advanced DER systems for 5 to 10 sites
- Provide Chicago with a DER plan for industrial applications

Project Methods

- PHASE 1 (Completed June 2002)
  - Industrial Characterization Study
  - Site Selections
  - Chicago Industrial Energy Plan
- PHASE 2 (Completion January 2003)
  - Plant Evaluations/Data Gathering
  - Expert Panel Meeting
  - Engineering Studies
  - DE Integration Designs

Expert Panel Meeting Results

- Renewable Energy Methods
  - Digester for food waste (biofuel)
  - Digester for waste – clean water integration
  - Use food grade oil from process for fuel
  - Thermal depolymerization - carbon waste for fuel
- Emission Reduction Methods
  - Combust emissions using exhaust
  - Combust emissions on intake side
  - Xonon Gas Turbine - Low NOx
  - Ion exchange resins for VOC
- Heat Recovery Methods
  - Direct heating with prime mover exhaust
  - Process exhaust HR for preheating
  - Dry sludge waste using exhaust
  - Indirect heat exchanger for process oil heating
  - Desiccant for humidity controlled process
  - Absorption chiller using exhaust
  - High and low pressure steam production
  - Hot water production
  - Thermal storage
- Expert Panel Meeting - Facilitated by Energetics, Inc.
  - Equipment Manufacturers
  - Emission Control Experts
  - Project Developers
  - Distributed Generation Industry Experts
  - Project Team Members
- Results
  - Technologies and Methods
  - Limitations and Requirements
  - Conceptual Designs for Heat Recovery, Emissions Reduction and Process Improvement

GTI Energy Plan Incentives

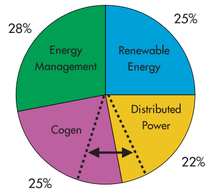
- **Demand Charges**
  Expand on-peak demand charge to reflect true cost
- **Standby Charges**
  Waive standby fee for on-peak clean energy (DER)
- **Utility Incentives**
  Cost savings from avoided distribution upgrades
- **Eliminate self-generation displacement rates**
- **Interconnect Fees**
  Establish reasonable fixed cost interconnect fee
- **Emissions Credits**
  Expand emissions credits and trading programs
- **Low interest loans**
  0% to 3% loans for on-peak clean energy projects
- **Reduce Technology Risk**
  Identify turnkey energy suppliers for the City

Results of Engineering Feasibility Studies

CANDIDATE PLANT	SYSTEM SIZE (kW)	ANNUAL SAVINGS	GAS ENGINES WITH HR APPLICATION
Concrete	7000	$1,186K	Exhaust to dryer furnace
Confectionery	3450	$798K	Exhaust for 125# steam, JW for 15# steam
Chemical	2050	$319K	SCR required, Exhaust and JW for 180F water
Dairy and Meat	1520	$296K	Exhaust for 80# steam
Snack Food	1300	$265K	Exhaust to oil heat HX
Primary Metals	1025	$243K	Exhaust to preheat furnace combustion air
Metal Products	775	$195K	Exhaust and JW 15# stm
Metal Plating	615	$64K	Exhaust and JW 15# stm

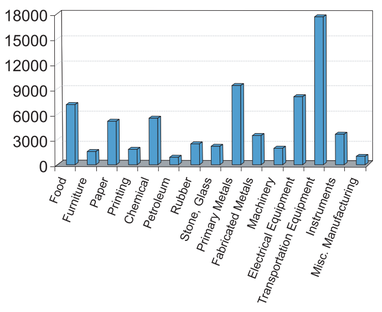
City of Chicago Mayor's Energy Plan

- **Chicago Energy Plan Goal by 2010 -** 5 Billion kWh Growth, 1 Billion kWh Existing
- **Industrial Program to contribute 15% of goal**



Chicago Characterization Study Results

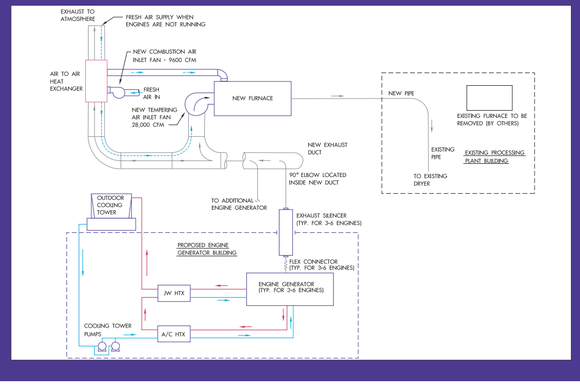
Average Electric Usage (MWh/yr)



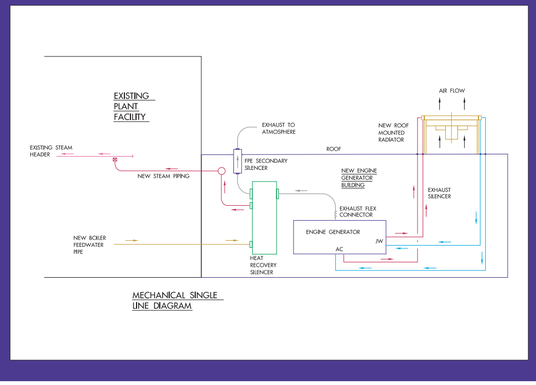
Summary

- **Significance of 2002 Accomplishments**
  - Annual energy savings for case studies: $100/kW to $250/kW
  - Doubling gas price is less than a 25% change in annual savings
  - Chicago electric rate structure favors on peak solutions
  - Most cost effective HR appears to be steam and direct exhaust
- **Planned Accomplishments for 2003**
  - Find industries to collaborate development of standard designs
  - Develop a plan to remove barriers and implement incentives
  - Identify funding sources and options from energy providers
  - Assist sites with bid evaluations and seek design options

Exhaust to Furnace Application



Steam Application



Exhaust to Oil Heat Exchanger Application